ODONATA OF THE SOUTH CENTRAL NEARCTIC REGION, INCLUDING NORTHEASTERN MEXICO[1]

John C. Abbott, Kenneth W. Stewart[2]

ABSTRACT: There has not been a concerted effort to document the extent of biodiversity, distribution and geographic affinities of the Odonata of the south central United States and northeastern Mexico. The area is an important boundary for some species representing eastern Nearctic and subtropical faunas, and a mixing zone or dispersal corridor for other species. Since 1993, we have done extensive collecting of all life stages in the seven biotic provinces of Texas, and compiled published and extensive unpublished records from the portions of these provinces of U.S. and Mexican states that join Texas. Here we list 228 species for this region (196 in Texas), indicate their distributions by biotic province, and discuss the regional biogeography and importance of rare species.

Current emphasis on inventorying aquatic insects of the neotropics Paulson 1982; (Gonzalez and Novelo 1991; Novelo and Gonzalez 1991; Quintero and Aiello 1992; Baumann and Kondratieff 1996; Gonzalez and Novelo 1996; McCafferty & Lugo-Ortiz 1996) and realization of the great risk to aquatic invertebrate biodiversity in temperate regions (Franklin 1988; Haffernik 1989, 1992), prompted us to investigate the status of the odonate fauna of the biotic provinces of Texas and adjoining states of the United States and northeastern Mexico that border the Rio Grande River. The odonate fauna of this region is poorly known except from scattered publication records, unpublished reports of collectors, the general documentation and discussion of Mexico's fauna by Gonzalez and Novelo (1996) and Johnson's (1972) work on Texas Zygoptera. There has never been a concerted effort to document the biodiversity and geographic affinities of the Odonata of this area. Over half of the species of Odonata still unknown as larvae are from this region (McCafferty et al. 1990).

The earliest major documentation of Odonata in Texas was by Hagen (1861). A number of species accounts from the state then appeared in Calvert (1901-1908) and Muttkowski (1910). Williamson (1914) listed numerous records for Texas and Oklahoma. Several localized studies within Texas have supplemented these works: Tinkham (1934) and Gloyd (1958) from West Texas and Tucker (1908), Ferguson (1940, 1942), Harwell (1951), Donnelly (1978), Williams (1982), and Laswell and Mitchell (1997) from north central and eastern parts of the state. Abbott (1996) reported the following new species records for Texas: *Aeshna psilus* Calvert, *Gomphus exilis* (Sélys), *Somatochlora georgiana* Walker, *Dythemis maya* Calvert, *Micrathyria didyma* (Sélys), *Sympetrum illotum*

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[2] Department of Biological Sciences, University of North Texas, Denton, Texas 76203 USA.

(Hagen), *Tauriphilia azteca* Calvert, and *Tramea insularis* Hagen. Johnson's (1972) treatise on Texas Zygoptera remains the only comprehensive faunal analysis of that group for the state. Young and Bayer (1979) compiled a list of the dragonfly larvae in the Guadalupe River basin in Texas. Only Kennedy (1921) has made a major effort to describe larvae of several species in the region.

Species lists have been published for the peripheral states of Louisiana (101 spp.; Bick 1957), Arkansas (133 spp.; Harp and Rickett 1977; Harp 1983a,b; Harp 1985; Harp and Harp 1996), Oklahoma (126 spp.; Bick and Bick 1957) and New Mexico (97 spp.; Evans 1995). These lists have been helpful additions to the knowledge of dragonfly and damselfly distributions in this region, but generally have not involved the systematic sampling of stream systems or vegetational or physiographic subregions (except Bick 1957), nor association with abiotic and biotic parameters of occurrence, necessary for biogeographic analysis.

STUDY AREA AND METHODS

The south central Nearctic Region, as we are defining it (Fig. 1), covers approximately 560,000 km^2, of which 412,000 km^2 are in Texas. It includes the seven biotic provinces of Texas and the portions of those provinces from Arkansas, Oklahoma, Louisiana, New Mexico and northeastern Mexico that immediately join Texas. The Mississippi River forms the eastern boundary, and the Navahonian biotic province bounds the western edge of the region. Mean annual precipitation ranges from 25-147 cm/yr, most falling in March-May. Major vegetation types include eastern pines and hardwoods, central prairies and grasslands and western deserts. The seven distinct regional biotic provinces differ in topography, temperature, vegetation, soil type, geology and climate as outlined by Blair (1950), Dice (1943) and Blair and Hubbell (1938). They are: 1) Chihuahuan, 2) Navahonian, 3) Kansan, 4) Balconian, 5) Tamaulipan, 6) Texan, and 7) Austroriparian (Fig. 1). Elevation ranges from sea level to 2,667 meters (Guadalupe Peak, Culberson Co., TX) in the Guadalupe Mountains National Park.

Intensive sampling, with emphasis on Texas, began in September, 1993 and included more than 30 expeditions transecting the biotic provinces or concentrating in such areas as the Guadalupe Mountains National Park of the Navahonian Province. Collection of adults and larvae involved sampling all traversed lotic habitats and selected lentic habitats. Documentation of the fauna of states adjacent to Texas was based primarily on both published and unpublished records of acknowledged collectors and museum holdings, and limited sampling.

Adults were placed in glassine envelopes and submerged in 99% acetone for overnight, then removed and allowed to dry completely before being per-

Figure 1. The six natural biotic provinces of the south central Nearctic Region (modified from Blair 1950, Dice 1943 and Blair and Hubbell 1938).

manently stored in polyethylene envelopes with data cards. Larvae were collected using a Wildco-type 46 x 22.5 cm net with a 1 mm mesh size. Exuviae were hand collected from emergence sites. Both exuviae and larvae were placed in Kahle's solution and then rinsed and permanently preserved in 80% ethanol upon returning to the laboratory. Numerous distribution records were based on reared species; mature larvae were transported alive to the laboratory in portable styrofoam rearing chambers as described by Szczytko and Stewart (1979), and reared in a conditioned Frigid Units Living Stream™ maintained at collection or slightly raised temperatures.

Collections Examined

We examined all regional material from the extensive and previously undocumented Beatty collection, housed at the Frost Entomological Museum of Penn State University (PSU) and from

the Arkansas State University Museum of Zoology (ASUMZ), Florida State Collection of Arthropods (FSCA), International Odonata Research Institute (IORI), Sul Ross State University (SRSU) and the Texas A&M Insect Collection (TAMU). Individuals and institutions who donated study material include T.W. Donnelly (Binghamton, New York), S.W. Dunkle (Collin County Community College), J. Gelhaus (Academy of Natural Sciences of Philadelphia), S. Jasper (Texas A&M University), B.C. Kondratieff (Colorado State University), D.R. Paulson (University of Puget Sound) and C.R. Nelson (University of Texas, Austin).

RESULTS

Table 1 lists the 228 species of damselflies and dragonflies currently known from the south central Nearctic biotic provinces (Fig. 1). The classification used here follows that of Garrison (1991), except that in our view *Epicordulia* and *Tetragoneuria* are considered subgenera of *Epitheca* (K.J. Tennessen pers. comm.). The following four species represent new Texas species records, and one, *Neoneura amelia*, is a new U.S. species record:

Neoneura amelia Calvert. TEXAS: Hidalgo Co., Rio Grande River nr. La Lomita Mission, W of Granjeno, 12 May 1997, 3♂, 2♀, Univ. of North TX Collection. New for the US.

Neoerythromma cultellatum (Hagen in Sélys). TEXAS: Hidalgo Co., Rio Grande River nr. La Lomita Mission, W of Granjeno, 12 May 1997, 2♂, Univ. of North TX Collection. New for Texas.

Aphylla williamsoni (Gloyd). TEXAS: Jefferson Co., 12 August 1989, 1♂, photograph taken by R.A. Honig. TEXAS: Montgomery Co., pond @ E side of IH 45 and S of FM 1488, 11 August 1997, 1♀, photograph taken by R.A. Behrstock. New for TX.

Somatochlora filosa (Hagen). TEXAS: Trinity Co., Rt. 94, 1.3 mi W of Angelina County line, 23 August 1995, 1♀, B. Mauffray Collection. New for TX.

DISCUSSION

The south central Nearctic Region (Fig. 1) is important as a boundary (Paulson 1982) for some species of the largely eastern fauna of central and east Texas (Texan and Austroriparian Provinces) that represent a temperate element, and those of south Texas and northeastern Mexico (Tamaulipan Province), representing a subtropical element. However, for other species these provinces are actually a mixing zone, and at least a short distance dispersal corridor; for example, our records indicate that of the 177 species occurring in the Austroriparian and Texan Provinces, 81 species (46%) also occur in the Tamaulipan Province and 59 species (33%) cross the Rio Grande to the south, into northeastern Mexico. Conversely, of the 108 species in the northeastern Mexico states of Tamaulipas and Nuevo Leon, 80 species (74%) cross the Rio Grande, entering Texas and 61 species (57%) occur in the Austroriparian and Texan Provinces.

A similar boundary or mixing phenomenon exists near the Rio Grande River between the more northern Kansan/Navahonian/Balconian and the more southern Chihuahuan Province. Of the 142 species occurring in the Kansan,

Navahonian and Balconian Provinces, 84 species (59%) also occur in the Chihuahuan Province and many of these cross the Rio Grande farther south, into northeastern Mexico. Conversely, of the 50 species in the northern Mexico states of Coahuila and Chihuahua, 41 species (82%) cross the Rio Grande, entering Texas with 39 (46%) of them occurring in the Kansan, Navahonian and Balconian Provinces.

The Balconian Province represents diverse species assemblages from the northern and southern provinces bordering or near it. Fifty percent (99) of the 199 species occurring in the northern Navahonian/Kansan/Texan/Austroriparian Provinces occur in the southern Chihuahuan/Tamaulipan Provinces. Conversely, 93 (69%) of the 135 species occurring in the southern Chihuahuan/Tamaulipan Provinces occur in the northern Kansan/Texan/Austroriparian Provinces. These examples and recent discoveries of dispersals across the Rio Grande (Abbott 1996), including *Neoneura amelia* Calvert, *Neoerythromma cultellatum* Hagen in Sélys, *Aeshna psilus* Calvert, *Dythemis maya* Calvert, *Micrathyria didyma* (Sélys), *Tauriphilia azteca* Calvert and *Tramea insularis* Hagen, from Mexico into Texas suggest that the area is indeed a dispersal corridor and that future dispersals across it may occur. These distinct species assemblages and mixing zones undoubtedly relate to the climate and vegetational characteristics defining these provinces. The Rio Grande border is a more effective barrier among certain groups than in others. The cordulegastrids and corduliids are poorly represented in Mexico, Central and South America, while groups such as the coenagrionids, aeshnids and libellulids are much more widely distributed and are well represented in these areas (Paulson 1982).

The large number of Odonata larvae still unknown to science from the southwestern U.S. is attributed in part to relatively less collecting effort (McCafferty et al. 1990) and low species densities in combination with sparse and patchy habitats (Provonsha and McCafferty 1973). The larval descriptions of many of these regional species are insufficient for identification purposes (McCafferty et al. 1990). The rarity and/or local distributions of many species in the eastern part of this region account for the large number of unknown larvae there.

Three species of Odonata in the south central Nearctic Region are listed as "species of concern" by the United States Fish and Wildlife Service. This federal listing identifies species "for which information now in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which persuasive data on biological vulnerability and threat are not currently available to support proposed rules" (USFWS 1996). Two species, *Somatochlora margarita* Donnelly and *Argia leonorae* Garrison have locally restricted distributions. *Argia leonorae* is known from only five counties in south and west Texas and in northern Mexico. The larva of this species, in its natural habitat, remains undiscovered.

A status survey of *Somatochlora margarita* conducted by the Texas Parks and Wildlife Department (Price et al. 1989) expanded its initial range, a five mile radius in the Sam Houston National Forest, to a now estimated 10,000 square mile area in east Texas and western Louisiana. *Somatochlora margarita* is endemic to the longleaf and loblolly pine forests of southeastern Texas. We are in the process of describing its larva from the exuviae of reared material (donated by S.W. Dunkle). We believe that rigorous sampling in the sandy bottom streams of the Big Thicket of East Texas will lead to the discovery of this larva in its natural habitat, and provide potential insights into its life history.

A third species, *Macromia wabashensis* Williamson, is also listed as Category 2 by the USFWS. Dubious records and the validity of *M. wabashensis* as a distinct species are factors leading to its Category 2 status. Several specimens referred to as *M. wabashensis* have been collected in McLennan and Falls Counties, Texas (Williams 1982). These records are currently thought to be exceptionally yellow forms of *M. taeniolata* Rambur or a hybrid between *M. taeniolata* and *M. pacifica* Hagen (Dunkle pers. comm.; Garrison 1995). It has thus been omitted from our list.

There is considerable taxonomic confusion concerning the *Tetragoneuria* group of this region. We provisionally list *Epitheca (T.) semiaquea* (Burmeister) from Texas and Oklahoma based on determinations made by K.J. Tennessen. Further study including DNA analysis is needed on this group.

Bick (1983) reported 32 species of North American Odonata (8% of that fauna) to be at risk, citing the loss of high-quality, undisturbed streams as the most significant factor endangering odonates in North America. Four of these (*Neoneura aaroni* Calvert, *Gomphus ozarkensis* Westfall, *Somatochlora margarita* Donnelly and *S. ozarkensis* Bird) occur in the south central U.S. and are considered rare (Bick 1983). Effective conservation efforts depend on accurate knowledge of the current distribution of each species (Moore 1991). Continued effort is needed to indicate which strategies should be taken to conserve particular species and which breeding sites should be given priority for protection.

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Table 1. Distribution of the 227 species of Odonata currently known from the south central Nearctic Region. Arkansas (AR), Austroriparian (AUST), Balconian (BALC), Chihuahua (CHI), Chihuahuan (CHIH), Coahuila (COA), Kansan (KANS), Louisiana (LA), Navahonian (NAVA), New Mexico (NM), Nuevo Leon (NLN), Oklahoma (OK), Tamaulipan (TAMA), Tamaulipas (TAM), Texan (TEXA) and Texas (TX). Distributional annotations are noted by: (*) = new state record, (**) = new U.S. record.

	United States					Mexico				Biotic Provinces						
	AR	LA	NM	OK	TX	CHI	COA	NLN	TAM	AUST	BALC	CHIH	KANS	NAVA	TAMA	TEXA
ZYGOPTERA (73)																
Calopterygidae (5)																
Calopteryx dimidiata Burmeister		X			X					X						
C. maculata (Beauvois)	X	X		X	X					X			X			X
Hetaerina americana (Fabricius)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
H. titia (Drury)	X	X		X	X			X	X	X	X	X	X	X	X	X
H. vulnerata Hagen in Sélys			X			X	X	X	X			X		X		X
Lestidae (9)																
Archilestes grandis (Rambur)	X		X	X	X	X		X	X	X	X	X	X	X		X
Lestes alacer Hagen			X	X	X		X	X	X	X	X	X	X	X	X	X
L. disjunctus australis Walker	X	X	X	X	X					X	X	X	X	X	X	X
L. forficula Rambur					X				X		X				X	X
L. inaequalis Walsh	X	X		X	X					X						
L. rectangularis Say	X			X						X			X			X
L. sigma Calvert				X	X			X	X			X			X	X
L. unguiculatus Hagen	X			X						X		X				X
L. vigilax Hagen	X	X		X	X					X						
Protoneuridae (3)																
Neoneura aaroni Calvert					X			X			X				X	
N. amelia Calvert**					*										X	
Protoneura cara Calvert					X				X		X				X	
Coenagrionidae (56)																
Acanthagrion quadratum Sélys					X			X	X		X				X	
Amphiagrion abbreviatum (Sélys)			X	X								X		X		X
Argia alberta Kennedy			X	X										X		X
A. apicalis (Say)	X	X	X	X	X			X		X	X	X		X	X	X
A. barretti Calvert					X			X	X		X	X			X	X
A. bipunctulata (Hagen)	X	X		X	X					X						X
A. cuprea (Hagen)					X			X			X				X	
A. fumipennis Burmeister	X	X	X	X	X			X		X	X	X	X	X	X	X
A. hinei Kennedy			X		X		X					X	X	X		
A. immunda (Hagen)	X		X	X	X	X		X	X	X	X	X	X		X	X
A. leonorae Garrison					X			X			X	X			X	X
A. lugens (Hagen)			X	X	X	X					X	X		X		
A. moesta (Hagen)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A. munda Calvert			X		X	X						X				
A. nahuana Calvert			X	X	X	X		X		X	X	X	X	X	X	X
A. plana Calvert	X		X	X	X	X	X	X		X	X	X	X	X	X	X
A. rhoadsi Calvert					X			X	X						X	
A. sedula (Hagen)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A. tibialis (Rambur)	X	X		X	X					X			X			X
A. translata Hagen in Sélys	X		X	X	X	X		X	X	X	X	X	X	X	X	X
Chromagrion conditum (Sélys)	X									X						
Enallagma antennatum (Say)				X												X
E. aspersum (Hagen)	X			X	X					X						X
E. basidens Calvert	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
E. boreale Sélys			X									X	X	X		
E. civile (Hagen)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
E. concisum Williamson		X								X						
E. cyathigerum (Charpentier)			X									X	X	X		
E. daeckii (Calvert)	X	X		X	X					X						
E. divagans Sélys	X	X		X	X					X						X
E. doubledayi (Sélys)					X											X
E. dubium Root		X		X	X					X						

Table 1 (Continued)

	United States					Mexico				Biotic Provinces						
	AR	LA	NM	OK	TX	CHI	COA	NLN	TAM	AUST	BAJC	CHIH	KANS	NAVA	TAMA	TEXA
E. durum (Hagen)		X			X				X	X					X	X
E. exsulans (Hagen)	X	X		X	X			X	X	X	X	X	X		X	X
E. geminatum Kellicott	X	X		X	X					X						X
E. novaehispaniae Calvert					X			X	X		X	X			X	
E. praevarum (Hagen)			X	X	X	X	X	X			X	X	X	X	X	
E. signatum (Hagen)	X	X		X	X					X	X		X		X	X
E. traviatum westfalli Donnelly	X	X		X	X					X						X
E. vesperum Calvert	X	X		X	X					X						X
Hesperagrion heterodoxum (Sélys)			X		X	X	X	X				X	X	X	X	
Ischnura barberi Currie			X	X	X						X	X	X	X		X
I. damula Calvert			X	X	X							X	X	X		
I. demorsa (Hagen)			X	X	X	X	X					X	X	X		
I. denticollis (Burmeister)			X	X	X	X						X	X	X		X
I. hastata (Say)	X	X	X	X	X			X	X	X	X	X	X	X	X	X
I. kellicotti Williamson	X	X		X	X					X						
I. perparva McLachlan in Sélys			X	X								X	X	X		
I. posita posita (Hagen)	X	X		X	X					X	X	X	X		X	X
I. prognata (Hagen)		X			X					X						
I. ramburii (Sélys)	X	X		X	X	X		X	X	X	X	X	X		X	X
I. verticalis (Say)	X		X	X	X					X			X	X		X
Nehalennia integricollis Calvert		X		X	X					X						
Neoerythromma cultellatum (Sélys)					*				X						X	
Telebasis byersi Westfall	X	X			X					X						
T. salva (Hagen)			X	X	X	X		X	X	X	X	X	X	X	X	X
ANISOPTERA (155)																
Petaluridae (1)																
Tachopteryx thoreyi (Hagen in Sélys)	X	X		X	X					X						X
Aeshnidae (16)																
Aeshna constricta Say	X									X						
A. dugesi Calvert			X		X			X				X	X		X	
A. multicolor Hagen			X	X	X					X	X	X	X	X		X
A. psilus Calvert					X				X		X				X	
A. umbrosa umbrosa Walker	X		X	X						X			X	X		X
Anax amazili (Burmeister)					X						X	X				
A. junius (Drury)	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
A. longipes (Hagen)	X	X		X	X					X	X					X
A. walsinghami McLachlan			X		X			X				X	X	X	X	
Basiaeschna janata (Say)	X	X		X	X					X	X		X			X
Boyeria vinosa (Say)	X	X		X	X					X	X					X
Coryphaeschna ingens (Rambur)	X	X			X					X					X	X
Epiaeschna heros (Fabricius)	X	X		X	X					X	X		X		X	X
Gomphaeschna furcillata (Say)	X	X			X					X						
Gynacantha nervosa Rambur				X					X	X					X	
Nasiaeschna pentacantha (Rambur)	X	X		X	X					X	X		X		X	X
Gomphidae (38)																
Aphylla angustifolia Garrison		X			X			X	X	X	X				X	X
A. protracta (Hagen)					X		X		X	X	X				X	X
A. williamsoni (Gloyd)		X			*					X						
Arigomphus lentulus (Needham)	X			X	X					X						X
A. maxwelli (Ferguson)	X	X			X					X						
A. submedianus (Hagen)	X	X		X	X					X	X					X
A. villosipes (Sélys)	X									X						
Dromogomphus armatus Sélys		X								X						
D. spinosus Sélys	X	X		X	X					X	X					X
D. spoliatus (Hagen in Sélys)	X	X		X	X			X	X	X	X		X		X	X
Erpetogomphus compositus Hag. in Sélys			X		X			X			X	X	X	X	X	
E. crotalinus (Hagen in Sélys)			X			X						X	X	X		
E. designatus Hagen in Sélys	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
E. eutainia Calvert					X				X						X	X
E. heterodon Garrison			X		X	X					X			X		
E. lampropeltis lampropeltis Kennedy			X		X	X					X			X		
Gomphus (Gomphurus) externus Hagen	X		X	X	X					X	X	X	X	X	X	X

Table 1 (Continued)	United States					Mexico				Biotic Provinces						
	AR	LA	NM	OK	TX	CHI	COA	NLN	TAM	AUST	BALC	CHIH	KANS	NAVA	TAMA	TEXA
G. (G.) gonzalezi Dunkle					X										X	
G. (G.) hybridus Williamson	X				X					X						X
G. (G.) modestus Needham	X	X			X					X						X
G. (G.) ozarkensis Westfall	X	X								X						
G. (G.) vastus Walsh	X			X	X					X	X				X	X
Gomphus (Gomphus) apomyius Donnelly	X	X			X					X						
G. exilis Sélys	X	X			X					X						
G. graslinellus (Walsh)	X			X	X					X	X					X
G. lividus (Sélys)	X	X			X					X						X
G. militaris Hagen			X	X	X			X		X	X	X	X	X	X	X
G. oklahomensis (Pritchard)	X	X		X	X					X						X
Hagenius brevistylus Sélys	X	X		X	X					X	X					X
Ophiogomphus westfalli Cook & Daigle	X									X						
Phyllogomphoides albrighti (Needham)			X		X			X	X	X	X	X		X	X	X
P. stigmatus (Say)			X	X	X			X			X	X	X		X	X
Progomphus borealis McLachlan			X		X	X	X				X	X	X	X		
P. obscurus (Rambur)	X	X		X	X					X	X	X	X	X	X	X
Stylogomphus albistylus (Hagen in Sélys)	X			X								X	X			
Stylurus intricatus (Hagen)			X		X							X	X	X		
S. laurae (Williamson)	X	X			X					X						
S. plagiatus (Sélys)	X	X		X	X					X	X		X		X	X
Cordulegastridae (3)																
Cordulegaster erronea Hagen *in* Sélys	X	X								X						
C. maculata Sélys	X	X			X					X						
C. obliqua obliqua (Say)	X	X		X	X					X						X
Corduliidae (24)																
Macromiinae (6)																
Didymops transversa (Say)	X	X		X	X					X	X		X			X
Macromia alleghaniensis Williamson	X									X						
M. annulata Hagen			X	X	X			X		X	X	X	X		X	X
M. illinoiensis georgina (Sélys)	X	X		X	X					X	X		X		X	X
M. pacifica Hagen	X			X	X					X	X				X	X
M. taeniolata Rambur	X	X		X	X					X						X
Corduliinae (18)																
Epitheca (Epicordulia) princeps Hagen	X	X		X	X					X	X		X		X	X
E. (Tetragoneuria) costalis (Sélys)	X	X		X	X					X	X					X
E. (T.) cynosura (Say)	X	X		X	X					X			X			X
E. (T.) petechialis (Muttkowski)			X	X	X					X	X		X	X		X
E. (T.) *semiaquea* (Burmeister)				X	X					X						X
E. (T.) spinosa Hagen	X	X		X						X						
Helocordulia selysii (Hagen)	X	X			X					X						
H. uhleri Sélys	X			X						X						
Neurocordulia alabamensis Hodges		X			X					X						
N. molesta (Walsh)	X	X		X	X					X						X
N. virginiensis Davis	X	X		X						X						
N. xanthosoma (Williamson)	X			X	X					X	X					X
Somatochlora filosa (Hagen)	X	X			*					X						
S. georgiana Walker		X			X					X						
S. linearis (Hagen)	X	X		X	X					X						X
S. margarita Donnelly		X			X					X						
S. ozarkensis Bird	X			X						X						
S. tenebrosa (Say)	X			X						X						
Libellulidae (73)																
Brachymesia furcata (Hagen)					X		X	X	X	X	X	X			X	X
B. gravida (Calvert)	X	X		X	X					X	X		X		X	X
B. herbida (Gundlach)					X				X	X	X					X
Brechmorhoga mendax (Hagen)	X		X	X	X			X	X	X	X	X	X	X	X	X
Cannaphila insularis funerea (Carpenter)					X			X							X	X
Celithemis amanda (Hagen)	X	X			X					X						
C. elisa (Hagen)	X	X		X	X					X	X					X
C. eponina (Drury)	X	X	X	X	X			X		X	X		X	X	X	X
C. fasciata Kirby	X	X		X	X					X	X					X
C. ornata (Rambur)		X			X					X						
C. verna Pritchard	X	X		X	X					X						

Table 1 (Continued)	United States					Mexico				Biotic Provinces						
	AR	LA	NM	OK	TX	CHI	COA	NLN	TAM	AUST	BALC	CHIH	KANS	NAVA	TAMA	TEXA
Dythemis fugax Hagen	X		X	X	X				X	X	X	X	X	X	X	X
D. maya Calvert					X	X		X	X			X			X	
D. nigrescens Calvert					X			X	X		X	X			X	X
D. velox Hagen	X	X	X	X	X	X		X	X	X	X	X	X		X	X
Erythemis collocata (Hagen)			X		X	X	X					X	X	X		
E. plebeja (Burmeister)					X				X		X				X	X
E. simplicicollis (Say)	X	X	X	X	X			X	X	X	X	X	X	X	X	X
E. vesiculosa (Fabricius)				X	X				X	X	X		X	X	X	X
Erythrodiplax berenice berenice (Drury)		X	X		X					X		X	X	X	X	X
E. connata (Burmeister)					X							X				
E. funerea (Hagen)					X			X			X				X	
E. fusca (Rambur)					X				X		X				X	
E. minuscula (Rambur)	X	X		X	X					X	X					X
E. umbrata (Linnaeus)	X	X		X	X			X	X	X	X	X	X		X	X
Libellula auripennis Burmeister	X	X		X	X				X	X					X	X
L. axilena Westwood	X	X								X						
L. comanche Calvert			X	X	X	X						X	X	X	X	X
L. composita (Hagen)			X		X							X	X	X		X
L. croceipennis Sélys			X	X	X			X	X	X	X	X	X		X	X
L. cyanea Fabricius	X			X	X					X	X		X			X
L. deplanata Rambur	X	X		X	X					X						X
L. flavida Rambur	X	X		X	X					X	X					X
L. forensis Hagen			X									X	X	X		
L. incesta Hagen	X	X		X	X					X	X		X			X
L. luctuosa Burmeister	X	X	X	X	X	X				X	X	X	X	X	X	X
L. lydia Drury	X	X	X	X	X			X		X	X	X	X	X	X	X
L. needhami Westfall	X	X			X				X	X					X	X
L. pulchella Drury	X	X	X	X	X					X	X	X	X	X	X	X
L. saturata Uhler			X	X	X	X	X	X		X	X	X	X	X	X	X
L. semifasciata Burmeister	X	X		X	X					X						X
L. subornata (Hagen)			X	X	X	X						X	X	X		
L. vibrans Fabricius	X	X		X	X					X						X
Macrodiplax balteata (Hagen)		X	X		X					X	X	X	X		X	X
Macrothemis imitans leucozona Ris					X			X	X		X				X	X
M. inacuta Calvert					X			X	X		X				X	
M. inequiunguis Calvert					X			X			X					
Miathyria marcella (Sélys)	X	X			X			X	X	X	X				X	X
Micrathyria aequalis (Hagen)					X			X	X						X	
M. didyma (Sélys)					X				X						X	
M. hagenii Kirby	X				X			X	X	X	X	X			X	X
Orthemis ferruginea (Fabricius)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pachydiplax longipennis (Burm.)	X	X	X	X	X		X		X	X	X	X	X	X	X	X
Paltothemis lineatipes Karsch			X		X	X		X			X	X	X	X	X	X
Pantala flavescens (Fabricius)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
P. hymenaea (Say)	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Perithemis domitia (Drury)					X	X		X							X	
P. tenera (Say)	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Pseudoleon superbus (Hagen)			X		X			X	X		X	X		X	X	
Sympetrum ambiguum (Rambur)	X	X		X	X					X			X			X
S. corruptum (Hagen)	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
S. costiferum (Hagen)			X										X			
S. illotum (Hagen)			X		X							X		X		
S. internum Montgomery			X	X										X		X
S. occidentale fasciatum Walker			X	X								X	X	X		
S. vicinum (Hagen)	X		X	X	X					X	X		X	X		X
Tauriphila azteca Calvert					X										X	
Tholymis citrina Hagen					X										X	
Tramea calverti Muttkowski					X						X				X	X
T. carolina (Linnaeus)	X	X		X	X					X		X				X
T. insularis Hagen					X							X				
T. lacerata Hagen	X	X	X	X	X				X	X	X	X	X	X	X	X
T. onusta Hagen	X	X	X	X	X			X	X	X	X	X	X	X	X	X
Totals	127	112	82	132	196	37	24	66	62	157	109	92	95	76	106	139

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